

## STATE WEATHER SERVICES.

[Temperature in degrees Fahrenheit; precipitation, including melted snow, in inches and hundredths.]

The following extracts and summaries are republished from reports for September, 1893, of the directors of the various state weather services:

## ALABAMA.

**Temperature.**—The mean was nearly 5.0 below the normal; maximum, 100, at Brewton, 17th; minimum, 40, at Maple Grove, 27th; greatest monthly range, 54, at Maple Grove; least monthly range, 26, at Citronelle and Elba.

**Precipitation.**—The average was 1.86 above the normal; greatest monthly, 11.58, at Mobile; least monthly, 0.60, at Clanton.

**Wind.**—Prevailing direction, east.—*W. M. Dudley, Observer, Weather Bureau, Montgomery, director.*

## ARIZONA.

**Temperature.**—The mean was 1.8 above the normal; maximum, 109, at Fort Mohave, 1st; minimum, 33, at Flagstaff, 10th; greatest monthly range, 57, at Crittenden; least monthly range, 34, at Walnut Ranch.

**Precipitation.**—The average was 0.29 above the normal; greatest monthly, 3.87, at Fort Grant; least monthly, 0.00, at Fort Mohave.

**Wind.**—Prevailing direction, southwest.—*W. Burrows, Observer, Weather Bureau, Tucson, director.*

## ARKANSAS.

**Temperature.**—The mean was 1.5 above the normal; maximum, 103, at Hot Springs, 14th; minimum, 36, at Keesees Ferry, 26th; greatest monthly range, 66, at Keesees Ferry; least monthly range, 38, at Winslow.

**Precipitation.**—The average was 0.63 above the normal; greatest monthly, 7.08, at Russellville; least monthly, 0.71, at Arkadelphia.

**Wind.**—Prevailing direction, south.—*F. H. Clarke, Local Forecast Official, Weather Bureau, Little Rock, director.*

## CALIFORNIA.

**Temperature.**—The maximum was 106, at Tulare, 1st; minimum, 30, at Tehachapi, 14th; greatest monthly range, 64, at Tulare; least monthly range, 18, at Point Lobos.

**Precipitation.**—The average was 0.48 above the normal; greatest monthly, 5.42, at Crescent City L. H.; least monthly, 0.00, at various places throughout the state.

**Wind.**—Prevailing direction, west.—*J. A. Barwick, Observer, Weather Bureau, Sacramento, director.*

## COLORADO.

**Temperature.**—The mean was 1.0 below the normal; maximum, 100, at Lamar, 7th and 12th, and at Minneapolis, 12th; minimum, 16, at Steamboat Spring, 27th.

**Precipitation.**—The average was about 0.04 above the normal; greatest monthly, 2.16, at La Jara; least monthly, 0.00, at Canyon City.

**Wind.**—Prevailing direction, south.—*J. J. Gilligan, Observer, Weather Bureau, Denver, director.*

## FLORIDA.

**Temperature.**—The mean was about normal; maximum, 100, at Bristol, 16th; minimum, 59, at Archer, 26th; greatest monthly range, 40, at Bristol; least monthly range, 15, at Mullet Key.

**Precipitation.**—The average was about 2.00 below the normal; greatest monthly, 12.49, at Archer; least monthly, 2.23, at Key West.

**Wind.**—Prevailing direction, east.—*E. K. Demain, Observer, Weather Bureau, Jacksonville, director.*

## GEORGIA.

**Temperature.**—Maximum, 100, at Poulan, 16th; minimum, 44, at Ramsey, 29th; greatest monthly range, 48, at Millen and Poulan; least monthly range, 25, at Marshallville.

**Precipitation.**—Greatest monthly, 9.07, at Dahlonega; least monthly, 1.79, at Dublin.

**Wind.**—Prevailing direction, south.—*Park Morrill, Local Forecast Official, Weather Bureau, Atlanta, director.*

## IDAHO.

**Temperature.**—Maximum, 100, at Oakley, 6th; minimum, 20, at Bonanza City and Martin, 22d, and at American Falls, 23d; greatest monthly range, 71, at American Falls; least monthly range, 59, at Fort Sherman and Kootenai.

**Precipitation.**—Greatest monthly, 10.39, at Kootenai; least monthly, 0.58, at Martin.

**Wind.**—Prevailing direction, southwest.—*J. H. Smith, Observer, Weather Bureau, Idaho Falls, director.*

## ILLINOIS.

**Temperature.**—The mean was 2.7 above the normal; maximum, 102, at Hennepin, 8th, and at Greenville, 14th; minimum, 27, at Aurora, 27th; greatest monthly range, 72, at Dixon; least monthly range, 40, at Muddy Valley.

**Precipitation.**—The average was 0.14 above the normal; greatest monthly, 6.83, at Cairo; least monthly, 1.21, at White Hall.

**Wind.**—Prevailing direction, southwest.—*John Craig, Observer, Weather Bureau, Springfield, director.*

## INDIANA.

**Temperature.**—The mean was 3.3 above the normal; maximum, 98, at

Lafayette, 7th; minimum, 30, at Delphi and Markle, 26th; greatest monthly range, 67, at Lafayette; least monthly range, 41, at Huntingburg.

**Precipitation.**—The average was 0.18 above the normal; greatest monthly, 7.62, at Seymour; least monthly, 1.53, at Farmland.

**Wind.**—Prevailing direction, southwest.—*Prof. H. A. Huston, Lafayette, director; C. F. R. Wappenhans, Local Forecast Official, Weather Bureau, assistant.*

## IOWA WEATHER AND CROP SERVICE.

**Temperature.**—The mean was 2.7 above the normal; maximum, 102, at Glenwood, 8th; minimum, 18, at Rock Rapids 25th, and at Sibley, 27th; greatest monthly range, 80, at Rock Rapids; least monthly range, 53, at Fort Madison.

**Precipitation.**—The average was about 1.36 below the normal; greatest monthly, 5.49, at Seymour; least monthly, 0.74, at Rock Rapids.

**Wind.**—Prevailing direction, southeast.—*J. R. Sage, Des Moines, director; G. M. Chappel, Local Forecast Official, Weather Bureau, assistant.*

## KANSAS.

**Temperature.**—The mean was 2.7 above the normal; maximum, 110, at Grenola, 13th; minimum, 29, at Lakin, 25th; greatest monthly range, 76, at Lakin; least monthly range, 48, at Syracuse.

**Precipitation.**—The average was 0.29 above the normal; greatest monthly, 5.99, at Columbus; least monthly, 0.73, at Wallace.

**Wind.**—Prevailing direction, south.—*T. R. Jennings, Observer, Weather Bureau, Topeka, director.*

## KENTUCKY.

**Temperature.**—The mean was slightly above the normal; maximum, 99, at Paducah, 15th; minimum, 35, at Eubank, 17th, and Harrodsburg, 27th and 28th; greatest monthly range, 61, at Harrodsburg; least monthly range, 33, at South Fork.

**Precipitation.**—The average was above the normal; greatest monthly, 8.20, at Wickliffe; least monthly, 1.85, at Flemingsburg.

**Wind.**—Prevailing direction, southwest.—*Frank Burke, Local Forecast Official, Weather Bureau, Louisville, director.*

## LOUISIANA.

**Temperature.**—The mean was about 1.0 above the normal; maximum, 105, at Liberty Hill, 15th; minimum, 48, at Winnboro, 17th and 27th, and at Girard, 28th; greatest monthly range, 51, at Winnboro and Liberty Hill; least monthly range, 26, at Lawrence.

**Precipitation.**—The average was about 0.06 above the normal; greatest monthly, 14.01, at Franklin; least monthly, 0.00, at Lake Charles.

**Wind.**—Prevailing direction, southeast.—*R. E. Kerkam, Local Forecast Official, Weather Bureau, New Orleans, director.*

## MARYLAND.

**Temperature.**—Maximum, 93, at Cambridge, 7th; minimum, 28, at Sunnyside, 29th and 30th; greatest monthly range, 56, at Boettcherville; least monthly range, 40, at McDonogh.

**Precipitation.**—Greatest monthly, 6.17, at Millsboro, Del.; least monthly, 1.40, at Sunnyside.

**Wind.**—Prevailing direction, northwest.—*Dr. William B. Clark, Johns Hopkins University, Baltimore, director; Prof. Milton Whitney, Maryland Agricultural College, secretary and treasurer; C. P. Cronk, Observer, Weather Bureau, in charge.*

## MICHIGAN.

**Temperature.**—The mean was 1.9 below the normal; maximum, 97, at Mottville, 5th; minimum, 19, at Grayling and Paris, 29th; greatest monthly range, 70, at Grayling and Howell; least monthly range, 44, at Sault Ste. Marie.

**Precipitation.**—The average was 1.50 below the normal; greatest monthly, 4.81, at Berrien Springs; least monthly, 0.53, at Marquette.

**Wind.**—Prevailing direction, southwest.—*E. A. Evans, Local Forecast Official, Weather Bureau, Detroit, director.*

## MINNESOTA.

**Temperature.**—The mean was 2.8 above the normal; maximum, 101, at Milan, 6th; minimum, 11, at Crookston, 26th; greatest monthly range, 86, at Milan; least monthly range, 55, at Duluth.

**Precipitation.**—The average was 1.87 below the normal; greatest monthly, 3.75, at Belle Plaine; least monthly, 0.17, at Ortonville.

**Wind.**—Prevailing direction, southeast.—*E. A. Beals, Observer, Weather Bureau, Minneapolis, director.*

## MISSISSIPPI.

**Temperature.**—The mean was normal; maximum, 100, at Vaiden, 15th; minimum, 41, at Macon, 26th; greatest monthly range, 53, at Macon; least monthly range, 31, at Moss Point and Pearlinton.

**Precipitation.**—The average was above the normal; greatest monthly, 10.98, at Okolona and Pearlinton; least monthly, 1.01, at Vicksburg.—*R. J. Hyatt, Local Forecast Official, Weather Bureau, Vicksburg, director.*

## MISSOURI.

*Temperature.*—The mean was 2.9 above the normal; maximum, 107, at Harrisonville, 14th; minimum, 80, at Grovedale, 26th; greatest monthly range, 71, at Columbia, Fayette, and Grovedale; least monthly range, 53, at New Madrid.

*Precipitation.*—The average was 0.80 above the normal; greatest monthly, 8.10, at Cabool; least monthly, 0.89, at Vermont.

*Wind.*—Prevailing direction, southwest.—*J. R. Rippey, Secretary, State Board of Agriculture, Columbia, director; H. A. McNally, Observer, Weather Bureau, assistant.*

## MONTANA.

No report was received from this service in time for this REVIEW.

## NEBRASKA.

*Temperature.*—The mean was 1.1 above the normal; maximum, 108, at Indianola, 4th; minimum, 19, at Bassett, 25th; greatest monthly range, 82, at Indianola; least monthly range, 58, at Kennedy.

*Precipitation.*—The average was 1.02 below the normal; greatest monthly, 3.63, at Tecumseh; least monthly, trace, at Wallace and Whitman.

*Wind.*—Prevailing direction, south.—*George E. Hunt, Local Forecast Official, Weather Bureau, Omaha, director.*

## NEVADA.

*Temperature.*—The mean was 5.2 below the normal; maximum, 99, at Downeyville, 2d; minimum, 16, at Stofiel, 22d; greatest monthly range, 71, at Sunnyside and McDermitt; least monthly range, 47, at Belmont.

*Precipitation.*—The average was 0.06 below the normal; greatest monthly, 2.22, at Lewers Ranch; least monthly, trace, at Ely, Sunnyside, and Tybo.

*Wind.*—Prevailing direction, southwest.—*Prof. Charles W. Friend, Carson City, director; F. A. Carpenter, Observer, Weather Bureau, assistant.*

## NEW ENGLAND.

*Temperature.*—The mean was 3.2 below the normal; maximum, 86, at Lynn, Mass., 10th, and at Somerset, Mass., 15th; minimum, 26, at Simonsville, Vt., 26th; greatest monthly range, 57, at Stratford, Vt.; least monthly range, 25, at Block Island, R. I.

*Precipitation.*—The average was 1.14 below the normal; greatest monthly, 4.54, at Easton, Me.; least monthly, 1.10, at Salisbury, Mass.

*Wind.*—Prevailing direction, northwest.—*J. Warren Smith, Observer, Weather Bureau, Boston, director.*

## NEW JERSEY.

*Temperature.*—The mean was 1.8 below the normal; maximum, 90, at Vineland, 7th; minimum, 31, at Charlotte, 28th and 30th; greatest monthly range, 54, at Vineland; least monthly range, 36, at Oceanic.

*Precipitation.*—The average was 0.69 below the normal; greatest monthly, 5.38, at Woodbine; least monthly, 1.93, at Asbury Park.

*Wind.*—Prevailing direction, northwest.—*E. W. McGann, Observer, Weather Bureau, New Brunswick, director.*

## NEW MEXICO.

*Temperature.*—The mean was about normal; maximum, 98, at Embudo, 16th; minimum, 28, at Halls Peak, 11th, and Monero, 19th; greatest monthly range, 63, at Embudo; least monthly range, 37, at Santa Fe.

*Precipitation.*—The average was considerably above the normal; greatest monthly, 4.42, at Gallinas Spring; least monthly, 0.95, at Coolidge.—*H. B. Hersey, Observer, Weather Bureau, Santa Fe, director.*

## NEW YORK.

*Temperature.*—The mean was 2.4 below the normal; maximum, 86, at Waverly, 5th; minimum, 25, at South Kortright, 30th; greatest monthly range, 55, at Varysburg; least monthly range, 35, at Setauket.

*Precipitation.*—The average was 0.24 below the normal; greatest monthly, 5.96, at Newark Valley; least monthly, 1.55, at West Chazy.

*Wind.*—Prevailing direction, west.—*Prof. E. A. Fuytes, Dean of the College of Civil Engineering, Cornell University, Ithaca, director; R. M. Hardinge, Observer, Weather Bureau, assistant.*

## NORTH CAROLINA.

*Temperature.*—The mean was 0.3 below the normal; maximum, 95, at Wilmington, 20th; minimum, 33, at Blowing Rock, 29th; greatest monthly range, 54, at Tarboro; least monthly range, 25, at Hatteras.

*Precipitation.*—The average was 0.97 above the normal; greatest monthly, 15.56, at Horse Cove; least monthly, 1.27, at Kittyhawk.

*Wind.*—Prevailing direction, west.—*Dr. Herbert B. Battle, Raleigh, director; C. F. von Herrmann, Observer, Weather Bureau, assistant.*

## NORTH DAKOTA.

*Temperature.*—The mean was 2.5 above the normal; maximum, 102, at New Salem, 3d; minimum, 8, at Berlin, 27th; greatest monthly range, 92, at New Salem; least monthly range, 63, at Reynolds.

*Precipitation.*—The average was 0.82 below the normal; greatest monthly, 2.31, at Dunseith; least monthly, trace, at Fort Yates.

*Wind.*—Prevailing direction, northwest.—*W. H. Fallon, Observer, Weather Bureau, Bismarck, director.*

## OHIO WEATHER AND CROP SERVICE.

*Temperature.*—The mean was 0.7 above the normal; maximum, 100, at

Benton Ridge, 7th; minimum, 24, at Napoleon, Hedges, and Benton Ridge, 26th, and at Findlay and Chicago Junction, 29th; greatest monthly range, 76, at Benton Ridge; least monthly range, 47, at Cincinnati.

*Precipitation.*—The average was 2.90 below the normal; greatest monthly, 8.90, at Cincinnati; least monthly, 0.36, at Circleville.

*Wind.*—Prevailing direction, west.—*L. N. Bonham, Columbus, director; C. M. Strong, Observer, Weather Bureau, assistant.*

## OKLAHOMA.

*Temperature.*—The mean was about normal; maximum, 108, at Fort Sill, 14th; minimum, 40, at Sac and Fox Agency, 26th.

*Precipitation.*—The average was about normal; greatest monthly, 7.87, at South McAlester; least monthly, 1.17, at Fort Reno.

*Wind.*—Prevailing direction, south.—*J. I. Widmeyer, Observer, Weather Bureau, Oklahoma City, director.*

## OREGON.

*Temperature.*—The mean was 2.7 below the normal; maximum, 103, at New Bridge, 2d; minimum, 22, at Burns, 18th; greatest monthly range, 73, at New Bridge; least monthly range, 28, at Bandon.

*Precipitation.*—The average was 1.53 above the normal; greatest monthly, 7.09, at Glenora; least monthly, 0.64, at New Bridge.

*Wind.*—Prevailing direction, southwest.—*Hon. H. E. Hayes, Master State Grange, Portland, director; B. S. Pague, Local Forecast Official, Weather Bureau, assistant.*

## PENNSYLVANIA.

*Temperature.*—The mean was 2.2 below the normal; maximum, 90, at Huntingdon, 5th, at Carlisle, 19th, and at Somerset, 19th and 20th; minimum, 28, at New Castle, 29th, at Huntingdon, 30th; greatest monthly range, 68, at Hollidaysburg; least monthly range, 41, at Coopersburg.

*Precipitation.*—The average was 0.86 below the normal; greatest monthly, 5.59, at Hamburg; least monthly, 0.72, at Saegertown.

*Wind.*—Prevailing direction, west.—*Under direction of the Franklin Institute, Philadelphia: W. P. Tatham, director; H. L. Ball, Observer, Weather Bureau, assistant.*

## SOUTH CAROLINA.

*Temperature.*—Maximum, 98, at Kingstree, 20th; minimum, 46, at Greenville, 30th.

*Precipitation.*—Greatest monthly, 18.08, at Central; least monthly, 1.10, at Allendale.

*Wind.*—Prevailing direction, southwest.—*J. H. Harmon, Observer, Weather Bureau, Columbia, director.*

## SOUTH DAKOTA.

*Temperature.*—The mean was 4.0 above the normal; maximum, 106, at Alexandria, 3d; minimum, 9, at Castlewood, 27th; greatest monthly range, 91, at Ashcroft and Webster; least monthly range, 64, at Rosebud.

*Precipitation.*—The average was 1.19 below the normal; greatest monthly, 1.21, at Howard; least monthly, trace, at Fort Sully, Oelrichs, and Piedmont.

*Wind.*—Prevailing direction, southeast.—*S. W. Glenn, Local Forecast Official, Weather Bureau, Huron, director.*

## TENNESSEE WEATHER AND CROP SERVICE.

*Temperature.*—The mean was 0.8 above the normal; maximum, 98, at Hohenwald, 5th; minimum, 40, at Harriman, 29th; greatest monthly range, 56, at Hohenwald; least monthly range, 35, at Knoxville and Bethel Springs.

*Precipitation.*—The average was 1.19 above the normal; greatest monthly, 8.39, at Clarksville; least monthly, 1.45, at Knoxville.

*Wind.*—Prevailing direction, northwest.—*J. B. Marbury, Local Forecast Official, Weather Bureau, Nashville, director.*

## TEXAS.

*Temperature.*—The mean was 1.9 above the normal; maximum, 116, at Twohig, 8th; minimum, 41, at Fort Hancock, 8th and 9th; greatest monthly range, 61, at Quanah; least monthly range, 20, at Menardville.

*Precipitation.*—The average was 2.60 below the normal; greatest monthly, 5.27, at Amarillo; least monthly, trace, at Brady and Victoria.

*Wind.*—Prevailing direction, south.—*D. D. Bryan, Galveston, director; I. M. Cline, Local Forecast Official, Weather Bureau, assistant.*

## UTAH.

*Temperature.*—The mean was 2.0 below the normal; maximum, 99, at Fillmore, 25th; minimum, 12, at Scofield, 24th; greatest monthly range, 70, at Fillmore, Soldier Summit, and Scofield; least monthly range, 44, at Moab.

*Precipitation.*—The average was above the normal; greatest monthly, 1.51, at Singletree; least monthly, trace, at Saint George.

*Wind.*—Prevailing direction, southwest.—*G. N. Salisbury, Observer, Weather Bureau, Salt Lake City, director.*

## WEST VIRGINIA.

*Temperature.*—Maximum, 91, at Point Pleasant, 15th; minimum, 80, at Central Station, 29th; greatest monthly range, 60, at Central Station; least monthly range, 46, at Pleasant Hill.

*Precipitation.*—Greatest monthly, 4.53, at Hinton; least monthly, 1.06, at Wheeling.

*Wind.*—Prevailing direction, southwest.—*W. W. Dent, Observer, Weather Bureau, Parkersburg, director.*

## WISCONSIN.

*Temperature.*—The mean was 1.0 below the normal; maximum, 98, at Osceola, 10th; minimum, 12, at Ashland and Menomonee, 28th.

*Precipitation.*—Greatest monthly, 8.86, at Manitowoc; least monthly, 1.09, at Viroqua.

*Wind.*—Prevailing direction southeast.—*W. L. Moore, Local Forecast Official, Weather Bureau, Milwaukee, director.*

## VIRGINIA.

*Temperature.*—Maximum, 95, at Saluda, 9th; minimum, 32, at Hot Springs, 29th; greatest monthly range, 61, at Avon; least monthly range, 38, at Cape Henry and Norfolk.

*Precipitation.*—Greatest monthly, 9.43, at Irwin; least monthly, 2.38, at Big Stone Gap.

*Wind.*—Prevailing direction, southwest.—*Dr. E. A. Craighill, Lynchburg, director; J. N. Ryker, Observer, Weather Bureau, assistant.*

## WASHINGTON.

*Temperature.*—The mean was 2.0 below the normal; maximum, 102, at Connel, 1st; minimum, 26, at Centerville, 22d.

*Precipitation.*—The average was 0.03 below the normal; greatest monthly, 6.04, at Tatoosh Island; least monthly, 0.32, at Fort Simcoe.

*Wind.*—Prevailing direction, southwest.—*H. F. Alciatore, Observer, Weather Bureau, Olympia, director.*

## WYOMING.

*Temperature.*—The mean was slightly above the normal; maximum, 99, at Wheatland, 3d; minimum, 21, at Lander, 22d, and at Saratoga, 24th; greatest monthly range, 73, at Sheridan; least monthly range, 54, at Laramie.

*Precipitation.*—The average was below the normal; greatest monthly, 1.57, at Sheridan; least monthly, trace, at Wheatland.

*Wind.*—Prevailing directions, northwest and southwest.—*E. M. Ravenscraft, Observer, Weather Bureau, Cheyenne, director.*

## OBSERVATIONS ON THE GREAT LAKES.

The Lake Marine Section of the Forecast Division has received monthly reports of the weather from captains of vessels navigating the Great Lakes as follows:

May, 1893, one report; June, 1893, two reports; July, 1893, sixteen reports; August, 1893, thirty-three reports; September, 1893, thirty reports.

The following notes are gleaned from the records of these marine observers:

July 15.—Capt. John Cochrane, of the s. s. "Marion," about 40 miles south of Pilot Island, Lake Michigan, reports the aurora borealis. Capt. C. H. Bassett, of the s. s. "Manola," east of Mackinaw City, reports the same aurora. Capt. W. W. Brown, of the s. s. "Choctaw," in the northern portion of Lake Huron, reports "northern lights nearly cover the whole sky." Capt. B. Nelson, of the s. s. "George T. Stope," on Lake Huron, reports a brilliant aurora between July 15, 10 p. m., and July 16, 3 a. m., standing from the northwest to south-southeast.

August 5, 6, 12, 13.—Brilliant auroras reported by many observers.

August 5.—Numerous meteors reported by several captains.

Capt. H. Zealand, of the s. s. "Selwyn Eddy," reports, August 18, 24, 27, respectively: "On each day four bottles were thrown overboard between Detour and Thunder Bay."

August 20.—Aurora reported by Capt. James Parsons, of the s. s. "Charles Hedard," in the eastern part of Lake Superior.

August 8, 9, 11.—Numerous meteors, and August 12, 18, brilliant auroras reported by Capt. H. Cronkhite, of the s. s. "Japan."

Capt. J. C. Ackerman, of the s. s. "City of Marquette," reports twenty bottles planted September 19-27, and a very bright aurora September 27.

Capt. Edward Mooney, of the s. s. "Wawatam," September 5, near the Saint Marys River, reports northern lights.

Capt. R. E. Gain, of the s. s. "W. H. Sawyer," September 8, midnight, bright northern lights; September 11, 6 p. m., the wind was from the north at the surface of the water, but from the south at the masthead; September 19, pale yellow sunset, indicating fresh northwest winds.

Capt. Frank D. Root, of the s. s. "Maritana," in the eastern portion of Lake Superior, September 8, reports a fine display of northern lights.

Capt. E. M. Smith, of the s. s. "Northern Queen," reports, September 5, in the Saint Marys River, brilliant aurora all night; September 27, western part of Lake Superior, very brilliant aurora.

Capt. W. H. Campan, of the s. s. "Northern King," on Lake Superior, September 5, 2 a. m. to 3.20 a. m., reports fine aurora; September 20, on Lake Superior, 1 a. m. to 3 a. m., aurora.

Capt. C. W. Lockwood, of the s. s. "B. L. Pennington," September 16, near Saint Marys River: Northwest squalls, with rain; wind as high as 50 miles per hour at short intervals; from 8 a. m. to 2 p. m. gale at its highest fury. 45 to 55 miles per hour; barometer rising fast; the first dangerous gale in these latitudes since April.

Capt. John Low, of the s. s. "Kaliyuga," complains that the wreck of the schooner "Pelican," 1½ miles north of the Ashtabula Lights, is a very dangerous object, and a similar wreck, the "David Vance," exists at Point Pelee; also another south-southeast of Bar Point Light, all of which should be blown up.

Capt. Thomas Hackett, of the s. s. "Volunteer," reports: September 16, at anchor at Fish Point, the heaviest gale of the season, velocity 50 miles from the southwest to the northwest; September 30, have had heavy northerly winds for three days, signals not put up at Sand Beach until 11 a. m. to-day;

September 4, 5 a. m., off Point Austin, heaviest thunder and lightning ever experienced, very heavy rain and the wind from the southeast; September 5, northern lights in the evening; September 17, northern lights last night; September 30, southeast and south-southeast gale blowing for over 30 hours, wind 50 miles an hour, barometer very high, and heavy sea from southeast. The longest steady southeast blow that he can remember.

Capt. D. Hourigan, of the s. s. "Hecla," September 7, off Big Sodus, on Lake Ontario: 2 a. m. to daylight heavy lightning and southeast winds; September 11, Lake Ontario, 1 a. m. to 3 a. m., very bright northern lights.

Capt. John M. Gee, of the s. s. "City of Racine," September 23, between Muskegon and Chicago: A remarkable strong current on the east shore of Lake Michigan, running to the southward.

The co-operating observers also forward the investigation of the currents in the Lake waters by depositing floating bottles with inclosed papers which, when found cast up on shore, are to be returned by mail.

A Current Chart of the Great Lakes was published in September, showing the results of the efforts made by the Weather Bureau in 1892 to obtain some idea of the currents of the Great Lakes. A large number of bottles inclosing printed forms were dropped overboard by navigators at many places in the open water on the Lakes. Of these 463 have been picked up and returned; the bottles were so weighted as to float just beneath the surface of the water. Although the surface-drift is rendered irregular by the variations of the winds, yet, in general, it may be stated that the eastward motion on Lake Superior toward the Saint Marys River is very decided; on Lake Michigan there is a strong southward surface movement on the western shore which gradually turns eastward and becomes northeast or north on the eastern shore of the Lake until finally it becomes a steady flow toward the Straits of Mackinaw; on Lake Huron the surface flow is toward the south, deviating eastward in the eastern portion with a decided set into the Georgian Bay, and also deviating westward with a decided set into Saginaw Bay, but in the extreme southern part of the lake the motion is steadily toward the River Saint Clair; on Lakes Erie and Ontario the wind drives the surface water, with but little variation, east-north-east toward the respective outlets. As these returns all relate to the season of navigation for 1892, and principally from April to October, the surface-floats here discussed must have described their courses within the space of a few months, and although some of them may have described irregular paths, of which we can have no knowledge, yet many of the bottles must have passed in comparatively direct lines. We may infer that deeper, gentle currents must have existed in directions opposed to those of the surface currents, and these under currents will doubtless be found to have an appreciable influence on the formation of the bottom of the Lakes.